INCOME GAP BETWEEN FORMAL-INFORMAL WORKERS: AN EVIDENCE FROM AGRICULTURE IN INDONESIA

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***Abstract*—The Indonesian structure of profession is still dominated by agriculture, forestry, and fisheries, with high poverty levels and a high proportion of informal workers. Using the Blinder-Oaxaca decomposition method, this study aims to see the influence of discrimination and characteristics of formal and informal workers in agriculture, forestry, and fisheries. Results show that the discrimination factor has more impact than the endowments factor. The endowment factors that affect income are age, gender, region of residence, marital status, the existence of toddlers, and on-the-job training.**

Keywords— agriculture, informal, income, Blinder Oaxaca

I. INTRODUCTION

The Indonesian Structure field of profession shows a pattern that doesn't look far different in August 2019, February 2020, and August 2020, which is still dominated by agriculture, forestry, and fisheries. In August 2020, the proportion of the population working in agriculture, forestry, and fisheries reached 29.76 percent. Agriculture has characteristic features the level of poverty is high and is dominated by the informal sector. In 2020 poverty level in agriculture was 12.52 percent. Whereas based on the job, as many as 88.57 workers in agriculture work in the informal sector. The poverty level and the proportion of informal workers in agriculture occupy the first rank compared to other fields.

One of the factors that influence poverty is income received by workers. Theoretically, workers with abilities and the same job types will have the same income, although they work in a different fields. However, in reality, that's not always happened. Slichter (1950)[1] became a pioneer in inter-industry wage differential theory, who found wage variation for workers, although they were already controlled by location, worker skill, and gender. Another study conducted refers to inter-industry wage differential theory earlier like Dickens dan Katz (1987)[2], who discovered that although controlled by labor characteristics and human capital factors, they found a wage gap between high-skilled and low-skilled workers. The latest study is based on Slichter (1950) conducted by Menezes dan Raposo (2011)[3] who found proof that a big company pays their workers higher than a small company, which variables that affect it are age, gender, level of education, types of contract, and hours of working. However, all of the studies above are still too simple to inference differences in wages between the industry that is only through correlation method.

This research will analyze wage differences between industries using a more comprehensive method, the Blinder-Oaxaca decomposition method [4,5]. This method decomposes the wage inequality factor into two parts: the difference of observed characteristics (explained variable) or differences in endowment like age, education, experience, and type of job. The second part is differences in treatment and assessment between two groups in the labor force market or differences in characteristics that are not observed (unexplained variable) or usually called differences as a consequence of discrimination.

Several studies had been conducted using the Blinder-Oaxaca decomposition method including Herrera-Idaraga, Lopez-Bazo, dan Motellon (2016) [6]; Motellon, Lopez-Baso and El-Attar (2011) [7] with refers to the difference in wages as a consequence of regional differences, Nogroho (2016) [8] who groups worker based on migration (migration wages differentials) and off course Blinder (1973) [3]; Oaxaca (1973) [4] which use discrimination theory to explain wage differences.

Using income instead of wage, we want to see the income gap in agriculture, forestry, and fishery. The worker will be grouped based on the main characteristic of agriculture which is the level of informality so that workers will become formal and informal agriculture workers.

II. METHODS

This study uses raw data from National Laborforce Survey (Sakernas) in 2020 which covers entire of Indonesia. The worker grouped into formal and informal workers of agriculture, forestry and fishery. Variables to be researched are income, human capital (education, disability status, certificates of training), and worker characteristics (age, type gender, region residence, marital status, and whereabouts of toddler). The definition of operational variable could be seen in table I.

Data were analyzed using the descriptive analysis method, multiple regression method, and the Blinder-Oaxaca decomposition method. Models used refers to the Mincer's earning function (1974) with details as following:

$$ln\ Y_i = \beta_0 + \beta_1 X_1 + \varepsilon_i \quad (1)$$

where $ln\ Y_i$ is the natural logarithm of monthly income. Substituting the function with independent variables to the

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equation so the empirical modeling of each group of worker is formulated as follow:

$$ln\ (income)_{f,n} = \beta_{0,f,n} + \beta_1 umur_{f,n} + \beta_2 umur^2_{f,n} + \beta_3 JK_{f,n} + \beta_4 SMP_{f,n} + \beta_5 SMA_{f,n} + \beta_6 PT_{f,n} + \beta_7 Kota_{f,n} + \beta_8 kwn_{f,n} + \beta_9 bal_{f,n} + \beta_{10} Dis_{f,n} + \beta_{11} Trai_{f,n} \quad (2)$$

The next step is to measure the wage gap between formal and informal workers using the Blinder-Oaxaca decomposition method to decompose the difference in the average income of the two groups. The method share level of income into two parts namely explained and the residual part that does not could be calculated by defined (unexplained) [3,4]. The unexplained part could be considered as factor discrimination but also can be interpreted as an amount from independent variable which is not entered in models.

To decompose, we could form wages function for each group namely as following:

$$ln\ Y_{if} = \beta_{0f} + \beta_f X_f + \varepsilon_i \quad (3)$$

$$ln\ Y_{in} = \beta_{0n} + \beta_n X_n + \varepsilon_i \quad (4)$$

The results of each group could be written as following:

$$ln\ \bar{Y}_{if} = b_f \bar{X}_f \quad (5)$$

$$ln\ \bar{Y}_{in} = b_n \bar{X}_n \quad (6)$$

The wage gap between two groups is the total difference in wages from formal and informal workers so that the value is determined with reduce equations (5) and (6):

$$\Delta\bar{Y} = (\bar{Y}_f - \bar{Y}_n) = b_f \bar{X}_f - b_n \bar{X}_n \quad (7)$$

To decompose the total income gap, equation (7) is necessary to be customized with average income counterfactual. In this research, the average income counterfactual uses formal workers as group reference meaning that formal workers get higher income. Hence the average income for informal workers could also be written as following:

$$CF = b_f \bar{X}_n \quad (8)$$

After the counterfactual factor is entered then the equation of the wages gap becomes as following:

$$\Delta\bar{Y} = (\bar{Y}_f - \bar{Y}_n) = (b_f \bar{X}_f - b_f \bar{X}_n) - (b_n \bar{X}_n - b_f \bar{X}_n) \quad (9)$$

$$\Delta\bar{Y} = (\bar{Y}_f - \bar{Y}_n) = b_f (\bar{X}_f - \bar{X}_n) - \bar{X}_n (b_n - b_f) \quad (10)$$

Description:

$b_f (\bar{X}_f - \bar{X}_n)$ = Difference because characteristic / endowment (explained

$(b_n - b_f)$ = unexplained

CF = Counterfactual variable

TABLE I. DEFINITION OPERATIONAL VARIABLE

No	Variable	Definition	Information
1	Index f n	Group formal agriculture workers (f) and informal agriculture workers (n)	
2	Ln(wage)	Income During a month ago	
3	umur	Age (calculated based on latest brithday)	
4	$umur^2$	Age square	
5	JK	Gender	0. Female 1. Male
6	Junior High School Senior High School University	Highest level of education completed	0. Primary school and below 1. high school/ university
7	Kota	Region of residence	0. Rural 1. Urban
8	kwn	Marital status	0. Not married 1. Ever Marry
9	ball	Existence toddler	0. No there is 1. There
10	Trai	Ownership certificate training	0. No 1. Yes

III. RESULT AND DISCUSSION

The respondent of this study is as many as 189,823 workers in agriculture, forestry, and fishery, which consists of over 19,450 formal workers (10.25 percent) and 170,373 informal workers sector (89.75 percent). This condition shows that informal workers still dominate the agriculture structure.

Table II compares the characteristics of sample agriculture, forestry, and fishery workers in both formal and informal sectors based on independent variables. The average age from the sample of formal workers is four years younger than the informal workers, who are 42 years old compared with 46 years old.

Men dominate both Formal and informal agriculture workers compared to women, which is 63.83 percent compared to 36.17 percent. By sectoral, the proportion of formal man worker sample is 81.58 percent, whereas men in the informal by 61.60 percent.

P.Todaro dan C.Smith (2012) [9] states that in urban, the availability of employment is higher and compensates for higher wages too. But on the other hand, agriculture activities are closely related to the vast use of land, so as seen in table II proportion of agriculture workers living in rural areas larger than those living in urban areas, both in the formal and informal sectors.

Based on marital status, the proportion of formal and informal workers who have married is relatively the same, above 85 percent. Based on the existence of toddlers, 73.38 percent of formal workers have no toddler, while 79.66 percent of informal workers have 79.66 percent.

After the discussion about the characteristics demographic of workers, one decisive factor of wages level is the quality of human capital, measured by disability status indicators and certificates training (on-the-job training). From the health side, 95.83 percent of workers in agriculture state that they have no health problems that will hinder their work, and this is a favorable condition in welfare enhancement. Giving training to farmers is not only capable increase knowledge and skills for farmers. More than that, activity training influences attitudes and motivates farmers to participate in the activity group. Ironically, the facts on the ground show that agriculture workers ever follow and have certificate training only 4.17 percent. If detailed again,

formal workers follow and have a certificate of 7.24 percent, whereas informal workers have 3.78 percent.

TABLE II. COMPARISON OF SAMPLE CHARACTERISTICS BY FORMAL AND INFORMAL WORKERS IN AGRICULTURE, FORESTRY AND FISHERIES

No	Information	formal	Informal	Total
1	Highest level of education completed (%)			
	• Not school-primary school	52.57	66.71	65.13
	• Junior high school			
	• Senior high school	20.79	17.44	17.82
	• University	22.69	14.31	15.24
		3.94	1.55	1.82
2	Average (y.o)	42.00	46.00	45.64
3	Gender (%)			
	• Male	81.58	61.60	63.83
	• Female	18.42	38.40	36.17
4	Region of residence (%)			
	• Urban	31.68	20.59	21.83
	• rural	68.32	79.41	78.17
5	Marital Status (%)			
	• Single	14.66	13.33	13.48
	• Ever Married	85.34	86.67	86.52
6	Existence Toddler (%)			
	• There is	73.38	79.66	78.96
	• None	26.62	20.34	21.04
7	Disability Status (%)			
	• No	93.66	90.23	90.61
	• Yes	6.34	9.77	9.39
8	Ownership Certificate Training (%)			
	• Not	92.76	96.22	95.83
	• Yes	7.24	3.78	4.17

Source : Sakernas 2020, processed

A. Characteristic of Income

This study aims to see wages difference between agriculture formal and informal workers. Before the analysis is conducted, it is necessary to know the average wage picture based on the independent variable as shown in table III.

The average income received by formal workers is 704 thousand rupiahs more than the average income received by informal workers. A sample of formal workers receives an average income of as big as 1,886,580 rupiahs per month, whereas informal workers receive an average income per month, which amounts to 1,181,789 rupiahs. Income received by formal workers shows a positive difference in each characteristic.

The most considerable differences in table III are in the workers with a College education level. In the sample that graduated from college, formal workers got an average income of 4,607,148 rupiahs. In contrast, the informal worker who graduates from college only receives an average income is 1,947,005 rupiah which means differences amounting up to 2,660,142 rupiahs. Besides that, based on the level of education, the average income of formal workers is higher than informal workers for every group in his teaching. Thereby could be concluded this condition follows the theory of income determinants based on human capital that individuals with a higher education level will get better income too.

TABLE III. COMPARISON OF AVERAGE INCOME ACCORDING TO CHARACTERISTICS SAMPLE (RP)

No	Information	formal	Informal	Average Income Worker Agriculture
1	Highest level of education completed (%)			
	• Not school-primary school	1,601,096	1,101,578	1,186,604
	• Junior high school	1,865,223	1,283,853	1,437,045
	• Senior high school	2,255,960	1,401,983	1,678,971
	• University	4,607,148	1,947,005	2,884,630
2	Average Income	1,886,580	1,181,789	1,331,852
3	Gender (%)			
	• Male	2,034,326	1,344,818	1,503,142
	• Female	1,265,019	733,557	820,204
4	Region of residence (%)			
	• Urban	1,928,821	1,220,899	1,385,921
	• rural	1,868,051	1,167,224	1,310,982
5	Marital Status (%)			
	• Single	1,603,269	1,127,845	1,277,232
	• Ever Married	1,949,326	1,188,256	1,339,503
6	Existence Toddler (%)			
	• There is	1,847,384	1,154,582	1,293,382
	• None	1,988,354	1,277,983	1,458,682
7	Disability Status (%)			
	• **No**	1,902,801	1,197,033	1,354,106
	• **Yes**	1,555,262	1,043,249	1,101,100
8	Ownernhip Certificate Training (%)			
	• **Not**	2,749,472	1,427,257	1,866,932
	• **Yes**	1,829,293	1,173,200	1,309,637

Source : Sakernas 2020, processed

B. Comparison With Provincial Minimum Income (UMP)

If you see according to the level of education, table IV shows the existence similarity pattern between formal and informal workers that is the higher the level of education the bigger of proportion workers who earn wages above the minimum wage.

Futhermore table V shows the distribution of workers according to wages received and by sectoral. Of the whole worker in agriculture only as much as 6,30 percent get income above the UMP while 93,70 percent get income below the minimum wage. If you see based on sectoral, formal workers earn income above UMP more than informal workers which are 23,16 percent against 4,15 percent.

TABLE IV. WORKERS ACCORDING TO SECTORAL , EDUCATION LEVEL AND COMPARISON AGAINST UMP

Sectoral	Below UMP (%)	Above UMP (%)
A. Formal		
• Not school-primary school	83.47	16.53
• Junior high school	74.76	25.24
• Senior high school	66.82	33.18
• University	56.96	43.04
B. Informal		
• Not school-primary school	96.16	3.84
• Junior high school	95.52	4.48
• Senior high school	95.23	4.77
• University	92.16	7.84

Source : Sakernas 2020, processed

TABLE V. WORKERS ACCORDING TO SECTORAL AND COMPARISON AGAINST UMP

Sector	Below UMP (%)	Above UMP (%)
Formal	76.84	23.16
Informal	95.85	4.15

Total	**93.70**	**6.30**

Source : Sakernas 2020, processed

C. Factors Affecting Income

From the formal and informal income model, all independent variables significantly influence variables 95% confidence interval, both simultan and partial. The coefficient determination R-square in the formal income model and informal workers are 19.89 percent and 13.35 percent. The low value of R-square is no problem because the data used is cross-section data with a high level of heterogeneity [10]. Following is the income model that is formed from table VI.

Formal agriculture income model:

ln (income) = 12,75333 + 0,0450 $umur_f$ - 0,0006 $umur^2_f$ + 0.4932 JK_f + 0,1238 SMP_f + 0,3013 SMA_f + 1,7681 PT_f - 0,0161 $Kota_f$ + 0,2483 kwn_f - 0,0349 bal_f - 0,1577 Dis_f + 0,0965 $Trai_f$

Informal agriculture income model:

ln (income) = 12,5198 + 0.0284 $umur_n$ - 0,0003 $umur^2_n$ + 0.6093 JK_n + 0,0809 SMP_n + 0,1297 SMA_n + 0,3687 PT_n + 0,0260 $Kota_n$ + 0,1856 kwn_n - 0,0159 bal_n - 0,0664 Dis_n - 0,0525 $Trai_n$

In general, the two models above show the direction of the same effect on each independent variable in the wage model both formal workers and informal workers. The difference between both models lies in the value of the independent variable coefficient showing the difference in the effect of each variable on the wage model for every group.

Variable age takes effect quadratic to formal and informal workers' income with the peak at the age of 46 years and 39 years. The reverse U pattern describes wages received will go up with increasing age and will return decreases at the point of a certain age. This result is in line with the opinion Nanfosso dan Akono (2009) [12]; Willis (1986) [11].

According to gender, the value coefficient shows that formal men workers get an income 49.32 percent higher than female workers. In contrast, informal men workers get an income 60.93 percent higher than female workers. This result follows a study by Anker, Melkas, dan Koren (2000) [13]

Education level takes to a positive effect on the earnings of male or female workers. This thing because the higher level of education, the productivity will higher too, so the possible income obtained will raise up [14].

By region of residence, informal workers in urban areas get an income 1.61 percent lower than workers in rural areas. On the contrary group of informal workers living in urban areas get an income 2.6 percent higher than informal workers in rural areas.

Marital status gives a positive influence to income received by both groups. This result is in accordance with the findings of Hewitt, Western, dan Baxter (2002) [15]; Nanfosso dan Akono (2009) [12]. Whereas the existence of toddlers turns out not in accordance with the hypothesis at the beginning which has an influence negative on wages received. It means workers who have toddlers accept wages lower than workers who don't have a toddler with details by 3,49 percent for the formal workers and 1.59 percent for informal workers. Allegedly this is because workers who have toddler work in low positions so that get low wages too [8] besides that there is a trend that working females will choose a profession with short working hours at the moment they have toddlers so that wages are also low [16]

Disability status also matters to income received which is lower wages by 15,77 percent for formal workers and 6.64 percent for informal workers. Workers who have a disability will lower productivity so that reasonable if the wages received are also lower [17]

TABLE VI. INCOME MODEL BASED ON FORMAL AND INFORMAL AGRICULTURE WORKER

Variable	formal		Informal	
	Coefficient	**P>|t|**	**Coefficient**	**P>|t|**
Constant	12.7533***	(0.0044)	12.5198***	(0.0029)
Age	0.0450***	(0.0002)	0.0284***	(0.0001)
Age^2	-0.0006***	(0.0000)	-0.0003***	(0.0000)
Gender				
Female (referenc)				
Man	0.4932***	(0.0012)	0.6093***	(0.0007)
Level of education				
Not school-primary school (refrence)				
Junior high school	0.1238***	(0.0013)	0.0809***	(0.0008)
Senior high school	0.3013***	(0.0033)	0.1297***	(0.0010)
University	0.7681***	(0.0010)	0.3687***	(0.0028)
Region of residence				
Rural (reference)				
Urban	-0.0161***	(0.0017)	0.0260***	(0.0007)
Marital Status				
Not Married (reference)				
Ever Married	0.2483***	(0.0012)	0.1856***	(0.0012)
Existence Toddler				
None (reference)				
There is	-0.0349***	(0.0023)	-0.0159***	(0.0008)
Disability Status				
No (reference)				
Yes	-0.1577***	(0.0022)	-0.0664***	(0.0010)
Certificate Training				
No (reference)				
Yes	0.0965***	(0.0044)	-0.0525***	(0.0018)
R-squared	**0.1989**		**0.1335**	

Standard errors in parentheses
*** p<0.01, **p<0.05, *p<0.1
Source : Results Sakernas 2020

D. Decomposition Income Gap by Formal and Informal Agriculture Workers

The size differences in wages level between formal and informal workers could be measured using the Blinder-Oaxaca decomposition method. This method not only could measure how big a wage gap is incurred but also can decompose the reason for the wage gap into two parts that is because characteristics of workers who are observed (endowment) and factors that are not could explain (factor

discrimination nor differentiation). Table VII shows the result of the Blinder-Oaxaca decomposition method.

TABLE VII. . BLINDER OAXACA DECOMPOSITION OF REVENUE WORKER FORMAL AND INFORMAL SECTOR IN AGRICULTURE , FORESTRY AND FISHERIES

lnwage	Coefficient	Robust Std Error	Z	P>z
Overall				
Group_1 (Formal)	14.2118***	(0.0000)	2.7e+04	0.000
Group_2 (Informal)	13.6534***	(0.0000)	4.3e+05	0.000
Difference (R)	0.5584***	(0.0000)	900.63	0.000
Explained (E)	0.0820***	(0.0000)	280.79	0.000
Coefficient (C)	0.4167***	(0.0000)	640.97	0.000
Interaction (I)	0.0597***	(0.0000)	153.55	0.000
%E = E/R	14.68			
% Discrimination = (C+I)/R	85.32			

Standard errors in parentheses

*** p<0.01, **p<0.05, *p<0.1

Source : Processed Sakernas 2020

Based on the Blinder-Oaxaca decomposition method, the magnitude wage gap between formal and informal workers is 0,5584 which means the average wage for formal workers is 14,68 percent higher than informal workers. From the value of 55.84 percent, the gap that occurs as much as 14.68 percent could be explained by the factor of endowment which is the different characteristics of formal and informal workers. The wage gap is incurred of course because discrimination factor and even the positive sign on coefficient factor endowment shows that differences in characteristics that occur will enlarge the wage gap.

Based on the coefficient of each endowment factor, the positive sign shows that the difference variable endowment will increase the gap, whereas the negative score sign will reduce the gap [18]. In table VIII, the negative sign coefficient is obtained by the marital status variable (not yet married/ever married) and ownership certificate training (yes/no), while other variables are marked positive. The most significant variable in the impact of the increased difference is gender, which is 4.55 percent, whereas the most significant variable that lower the difference is marital status, which reached 1.38 percent.

Age has a positive score because, in the long run, formal workers will reach the maximum age limit in their job field and switch to informal jobs. Thereby the higher age of workers, the larger gap occurred too [19]

Gender has the most considerable influence on widening the income gap from the coefficient score reached 4.55 percent. Mention that gender is a factor of discrimination especially moment job market players make it an element of consideration in the demand and supply of the labor market [20].

Furthermore, the estimation result shows that the region of residence variable is worth 0.0009, which has less impact on the widening gap. This value means if workers live in urban, then the gap will increase to 0.0009 with (ceteris paribus). This happened because the work field in urban needs high-skill as a consequence of technological progress, so agriculture workers, which are informal workers with low education dominate, will receive low payment there. This condition is in accordance with the study Burstein dan Vogel (2017)[21]

On-the-job training for workers will zoom out the gap with a value of 0.15 percent. The more trained a worker, the higher income received [22].

Overall, Based on the Blinder-Oaxaca decomposition method, the income gap between formal and informal agriculture workers is big because of discrimination. According to Dasgupta, Bhula-or, dan Fakthong (2015) [23] discrimination factors Among formal and informal workers can be caused by discrimination in the labor market and a lack of government policy in support workers. In relation to government support, Dumairy (1996) [24] also said that the right policies and strategies could lower the gap that occurred.

TABLE VIII. BLINDER OAXACA DECOMPOSITION OF INCOME WORKER FORMAL AND INFORMAL SECTOR IN AGRICULTURE , FORESTRY AND FISHERIES ACCORDING TO VARIABLE

Variable	Total Gap	Factor *Endowment*	Factor Discrimination
Age		0.0263	
Gender		0.0455	
Level of education		0.0220	
Region of residence		0.0009	
Marital Status		-0.0138	
Existence Toddler		0.0009	
Disability Status		0.0035	
Certificate Training		-0.0015	
Total	**0.5584**		**0.1244**

IV. CONDLUSIONS AND RECOMENDATIONS

A. Conclusions

1. Agriculture, Forestry, and Fishery are dominated by the informal sector, which reaches 89.75 percent

2. Both formal and informal workers in Indonesian agriculture have similar characteristics, which are dominated by unschooling to graduating from elementary school, being male, living in rural areas, ever married, having no toddler, having no health problems, and having no certificate training

3. Factor affecting the income gap is age, education level, gender, region of place residence, marital status, existence of toddlers, health problems, and ownership certificate

4. The income gap between formal and informal workers in agriculture occurred due to discrimination than characteristics of worker

5. Factors that widen the income gap are age, gender, education level, region residence, Health status, and the existence of toddler.

B. Recomendations

1. It's essential to encourage the farmer to make their business formal because there is a large discrimination factor that affects the income gap between formal and informal workers.
2. On-the-job training is known to make the income gap smaller. Therefore it's important to expand the opportunity for training and knowledge transfer for workers in the formal and informal sectors to produce workers with high skills and lower the level gap in the long term

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